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of a right pyramid is observable in the medulla. At the usual level the left pyramid divides, as in some of Mellus's cases, the greater part passing to the right side, about a fifth remaining on the left side. The striking point, however, is that the cord below the decussation very soon comes to present perfectly normal pyramidal tracts. It is difficult to explain how this can happen on any other assumption than that some, and it would seem the larger part, of the pyramidal fibres really arise in the cord, and not in the cortex, as is usually taught.

We are certainly indebted to Dr. Russell for a vigorous stirring of these already troubled waters, and there appears to be good reason to hope that they will clear into a much better anatomy and physiology of this difficult region than we have had heretofore.

C. F. H.

An Experimental Investigation of Eye Movements. J. S. RISIEN RUSSELL. *Journal of Physiology*, XVII, Nos. 2 and 3, pp. 1 to 27, 3 Figs. in text.

A serious difficulty in the localization of eye movements in the cerebral cortex has been the fact that only lateral movements have been obtained from cortical stimulation. Hughlings Jackson recently made the suggestion that the absence of other movements might be accounted for by the *degree* of representation of the various movements in the same general centre, the lateral movements of the eyes being predominantly represented over the area for control of the eyes. If this supposition be correct, by excluding these movements, cutting the lateral recti, it ought to be possible to obtain other movements on stimulating the motor eye centres. An experimental test of this suggestion in the hands of Dr. Russell proved Jackson's view to be correct, and this result cannot fail to exert a widespread influence upon general theories of cerebral localization. Beyond this point Dr. Russell discusses the relative control of the eyes by the cerebellum and cerebrum.

By cutting the external rectus of one side and internal rectus of the other, and stimulating the cortex of the side with the intact recti, the possibility of lateral movements was excluded and practically all the other movements of the eyes were obtained, viz., direct downward and upward rotations, rotations downward and to the opposite side and upward and to the opposite side, and occasionally also convergence, were obtained, each corresponding to a more or less clearly defined cortical area.

Ocular deviations artificially produced in dogs by ablation of the whole or part of the cortical area for eye movements on one side are recovered from in time, but reappear in narcosis, to be lost again in the total paralysis of the eye muscles normally occurring in the deeper states. Explanations founded on hypertrophy of residual cells, cerebellar compensation and compensation by the other hemisphere are suggested, but none is supported to the exclusion of the others. Careful control experiments on normal dogs were conducted to exclude false results.

Extirpation of one lateral half or part of one lateral half of the cerebellum produces downward and variable outward rotation on the opposite side. Total excision produces a downward and slightly outward rotation of both eyes. All experimentally induced rotations ultimately disappear, but may be caused to reappear in narcosis. Nystagmus is generally also present with slow jerking movements immediately after lesions, or, in cases of total extirpation, accompanying, and in the same direction as, voluntary move-

ments. This latter paralytic form, like the deviations themselves, gradually disappears, to reappear only in the first stages of narcosis. Control experiments on the labyrinth and eighth nerve do not overthrow the conclusions regarding the cerebellar influence upon eye movements.

Experiments consisting of ablations of cortical and cerebellar areas simultaneously and in sequence seem to show that one lateral half of the cerebellum and the opposite cortical centre exert a combined influence tending to move the eye in one direction, while the other lateral lobe and the other hemisphere give movements in the opposite direction. These two influences are antagonistic: take away the whole of one and the other predominates; take away half of each and the remaining halves antagonize each other. The cerebellum seems further to exercise a direct action on the ocular muscles perfectly independent of cortical mediation.

C. C. STEWART.

Obere Schleife und Hirnrinde. DR. MAX BIELSCHOWSKY. Neurolog. Centralblatt, Vol. XIV, p. 205.

Ein Beitrag zur Lehre vom Schleifenverlauf (obere, Rinden, Thalamusschleife). Von. DR. CHRISTFRIED JAKOB. Neurolog. Centralbl., Vol. XIV, p. 308.

Sur les connexions du ruban de Reil avec la corticalité cérébrale. M. et Mme. J. DEJERINE. Extrait des comptes rendus des séances de la Société de Biologie. Séance du 6 Avril, 1895.

The discussion on the central termination of the sensory pathways seems to come nearer a conclusion. There were practically two views represented: Flechsig and Hösel maintain that fibres which come from cells of the nuclei of Goll and Burdach and form the interolivary stratum and the fillet, terminate in the parietal region of the cerebral cortex. Von Monakow and Mahaim, on the other hand, state that there is no direct connection between the fillet and the cortex, but that the connection is indirect, by means of the optic thalamus.

Bielschowsky examined two dogs' brains, in which Professor Goltz had removed one hemisphere with the corpus striatum in one case and both hemispheres with the corpora striata in the other. The first dog lived two years and five months after the operation, the second nine months after removal of one and two months after removal of the other hemisphere. In both dogs, the optic thalamus was not injured, but showed secondary atrophy (just as in Von Monakow's experiments); the fillet, however, was neither atrophic nor degenerated; hence the conclusion that the fillet is merely a connection between the nuclei of Goll and Burdach and the optic thalamus, and that a second nerve cell is needed for the connection between the optic thalamus and the cortex.

The greatest and most valuable material has been published by M. and Mme. Dejerine. They have no less than nine cases in which the fillet was involved, and nineteen cases in which the fillet might have been involved, if Flechsig and Hösel's views were correct. Their cases allow the following conclusions:

1. In two cases with a lesion of the nuclei of Goll and Burdach, there is (ascending) degeneration of the fillet; the degeneration cannot be followed beyond the subthalamic region and the inferior part of the optic thalamus.

2. In three cases the fillet is destroyed in the region of the pons. The consequence is a descending degeneration, involving the inter-